The Class Act
DOE's Reservoir Class Program Newsletter
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TAKING TECHNOLOGY TO INDUSTRY

by Lance Cole, BDM-Oklahoma

THE APPROACH

BDM-Oklahoma, the Petroleum Technology Transfer Council (PTTC), and operators of the Class Projects jointly developed the Class 1 Traveling Technology Workshop. The workshops showed the common threads among the four Class 1 projects, the types of technologies being applied, technology successes and failures, and lessons learned. Presentations had a practical orientation, focusing on experience and economic benefits, where economic benefits could be specifically identified.

THE PARTICIPANTS

Operators from four near-term Class 1 projects were invited to participate in the traveling workshop. These projects were chosen because of their high likelihood of exhibiting synergy. Although relevant to all locations, the four projects are in the Mid-Continent and Rockies areas. Projects and speakers included:

- Oklahoma's FDD Reservoir (OK): Rick Andrews, University of Oklahoma Geo Information Systems
- University of Kansas Stewart and Savonburg Field Projects (KS): Lanny Schoeling and Rodney Reynolds, KU Center for Research, Inc.
- The University of Tulsa/Uplands Resources Glenn Pool Field Project (OK): Mohan Kelkar, University of Tulsa, and Dan Richmond, Uplands Resources
- Diversified Operating Co.'s Sooner Unit Project (CO): Mark Sippel, consultant for Diversified.

Two other speakers from industry also made their presentations. Oklahoma's Class 1 Morrow Play analysis included a detailed field study on the Northeast Rice Morrow Unit cooperating with Ensign Operating, the unit operator. Steve Harpham with Ensign Operating participated in the first two workshops describing Ensign's experience in waterflood implementation. At the last three workshops, Sandra Mark, a geophysical consultant, spoke on 3-D seismic interpretation work she had conducted as part of a Reservoir Characterization Consortia project at Colorado School of Mines.

THE RESULTS

Six workshops were held in January-Febrary 1996 at various locations. See the summary on the next page for locations, dates, and attendance figures, including the

cont'd on page 2

The Class Act is a quarterly newsletter devoted to providing information about DOE's Reservoir Class Program. The newsletter is produced by BDM-Oklahoma which manages the National Oil Program for the Department of Energy (DOE) and operates the National Institute for Petroleum and Energy Research (NIPER), a DOE petroleum research laboratory in Bartlesville, Oklahoma.

For further information on Class Program projects, contact DOE's Bartlesville Project Office (BPO):

Ph. 918-337-4293 Fax 918-337-4418
REPORTS Herb Tiedemann
CLASS 1& 3 PROGRAM MANAGER Edith Allison
CLASS 2 PROGRAM MANAGER Chandra Nautiyal
EDITORS Susan Jackson, Lance Cole
ASST. EDITOR Viola Rawn-Schatzinger
COPY EDITOR Irene Chang
DESIGNER Greta Creekmore

INSIDE

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speakers and representatives from PTTC and BDM-Oklahoma. Despite the mid-winter scheduling, only the Wichita workshop was affected by adverse weather. Industry attendees, primarily representing independents and consultants, received a workshop manual containing written papers and copies of presentations materials,

Location	Date	People
Bartlesville, OK	1/16	64
Wichita, KS	1/18	I 5 (storm)
Denver, CO	216	97
Billings, MT	218	47
Oklahoma City, OK	2/13	73
Grayville, IL	2127	55

Panel discussions incorporated into each workshop provided a forum for open interchange. These productive question and answer sessions enhanced the workshops' impact.

THE RESPONSE

Attendees had the opportunity to evaluate the workshops. Over 850/o of respondents at the first workshop in Bartlesville rated the value as either above average or high. Impact of the subsequent workshops was even greater, as authors incorporated the insight gained from interacting with the other presenters and attendees. Many respondents listed opportunities for applying the technologies discussed.

PTTC, which cooperated fully with BDM-Oklahoma in developing the workshops, discussed results of the workshops at its recent Board of Director's meeting in Tuscaloosa, Alabama. PTTC's Board of Directors is comprised of representatives from operators, service companies, professional Compact Commission, and PTTC's regional lead organizations. Their strong consensus was that DOE needs to be doing more of this type of outreach activity–more workshops, more locations, more projects, and more varied projects.

WHAT NEXT?

Even prior to getting the results from the Class 1 traveling workshop, BDM-Oklahoma began working with the Center for Energy and Economic Diversification (CEED) in Midland, Texas, to develop a one-day workshop focusing on Class 2 projects. This workshop will be held on May 15, 1996, in Midland, Texas. As the workshop is in Midland, a poster session at the workshop will highlight Class 3 projects in the Permian Basin area. For information on this workshop, contact CEED at 915 552-2430.

Videotapes of both the Class 1 traveling workshop and the Class 2 Permian Basin workshop will be available in PTTC's regional resource centers. BDM-Oklahoma and PTTC are exploring the use of regional experts and the videotapes to hold video workshops.

BDM-Oklahoma has responded to the message, "We need more of this type of thing." Within budget constraints, we are working to develop more workshops for late summer/fall of 1996. As appropriate, modern communications technology will be used to increase industry access. Stay tuned for new developments.

WHAT Operators SAY

This traveling workshop is among the best I've seen for demonstrating the latest field tested technology for oil and gas operators.

—Charles Mankin, PTTC South Mid-Continent Regional Director Head of Oklahoma Geological Survey as quoted in Tulsa World, January 21, 1996

I wasn't that interested in coming to this workshop, but after coming I was very impressed with the quality and content of the speakers.

***This was well* worth the *time and* money.**

— Larry Jack, Murfin Drilling, Wichita, Kansas

This will cause me to look at fields in a different light.

—Respondent, Bartlesville Workshop

Well organized and presented in a practical manner by people who understand the needs of industry . . . . I have never before realized benefit this quickly to *any* investment in training *or* education.

—Thomas K. Hohn, P. E., Consultant, Columbus, Montana

Technologies Used in Class 3 Projects

by Eugene Safley, BDM-Oklahoma

Nine Class 3 slope and basin elastics projects were recently awarded. Most projects have just begun Phase 1: data collection and analysis. Core analysis, well tests, and reservoir modeling are widely used for the design of horizontal drilling, thermal, and CO_2 projects (Table 1).

Near-Term Projects

City of Long Beach plans to improve waterflood recovery in Wilmington Field, California. Zones of high remaining oil saturation will be identified using cased-hole logging tools, 3-D geologic modeling, and improved well completion methods. Recovery of 28 million bbl more oil is projected.

Pacific Operators Offshore plans to drill and complete a trilateral horizontal well to tap three oil intervals and minimize water production in Carpinteria Field, offshore Santa Barbara, California. Reservoir characterization will help develop the well drilling and completion plan. Production time may be extended 7 years, and 1.5 million bbl more oil is estimated.

University of Texas Bureau of Economic Geology plans to optimize infill drilling and enhanced oil recovery projects in Geraldine Ford and West Ford fields, West Texas. Outcrop analysis, 3-D seismic, and simulation will aid design and implementation of a $C0_2$, polymer, or waterflood project. If successful, 10 million bbl more oil could be recovered.

University of Utah and partners plan to reactivate a lease in Midway Sunset Field, California. Core analysis, imaging logs, and simulation will be used to identify producibility problems. Successful design and use of a continuous steamflood could recover an added 2.9 million bbl of oil.

Mid-Term Projects

ARCO Western Energy plans to drill and hydraulically fracture a deviated well in Yowlumne Field, California. The well's 1,100-ft lateral section will diagonally traverse the productive thin-bedded reservoir sands, which are noneconomic to produce using vertical wells. Successful application could increase oil recovery by over 8 million bbl.

Chevron Production Co. plans a CO_1 flood in the fractured Monterey siliceous shales in Buena Vista Field, California. Reservoir description, fracture analysis, and simulation will be used to design the flood to reestablish reservoir energy. Recovery should improve 10-1.50/0 with potential oil recovery totaling over 20 million bbl.

City of Long Beach plans to add oil reserves and cut operating costs in the Tar zone of Wilmington Field, California. Modeling and three pilot tests will compare cyclic steam injection and steam drive using horizontal wells, and hot water alternating steam injection. Extending these techniques throughout the field could increase oil reserves by over 500 million bbl.

Parker and Parsley Development Co. plans to inject $C0_2$ into a naturally fractured reservoir to improve oil recovery by gravity drainage in the Sprayberry Trend, West Texas. Modeling fracture systems and simulating fluid interaction in pore systems will evaluate the feasibility and cost of gravity drainage. As over 6 billion bbl of oil remain in the trend, the potential is huge.

Strata Production Co. plans a development drilling and pressure maintenance program in Nash Draw Brushy Canyon Field, SE New Mexico. Well tests, 3-D seismic, geostatistics, and simulation will find areas of high remaining oil saturation, These techniques could recover 18 million more bbl and be applicable to other Delaware Mountain Group fields.

Table I Technologies Addressed in Class 3 Projects

	RESERVOIR DATA							ANALYSIS METHODS				PRODUCTION ENHANCEMENT								
	Core/Fluid Analysis	Outcrop Analysis	Fracture Analysis	Seismic	Advanced Logging	Well Tests	Digital Database	Reservoir Modeling	Geostatistics	Num. Simulation	Reservoir Mgt.	Recompletion	Stimulation	Infill Drilling	Directional Drilling	Waterflood	Gravity Drainage	CO_2	Thermal	Polymer
City of Long Beach	●				●	●	●	●			●	●			●	●				
Pacific Operators	●					●	●								●					
University of Texas BEG	●	●		●		●	●	●	●	●				●		●		●		●
University of Utah	●				●	●	●	●		●				●					●	
ARCO Western	●		●	●	●	●		●		●	●		●		●					
Chevron, USA	●	●	●	●	●	●		●	●	●	●							●		
City of Long Beach	●					●	●	●		●	●		●		●				●	
Parker & Parsley	●	●	●		●	●	●	●	●	●				●	●		●	●		
Strata	●			●		●	●	●	●	●				●	●	●				

Table I is based on technology descriptions in project statements of work. Over time, the project technologies may change in response to project results.

TIPS ON WELL STIMULATION IN THE BLUEBELL FIELD, UTAH

by Susan Jackson, BDM-Oklahoma

If you operate wells in the Green River or Wasatch Formations, you are well aware of the challenges of designing successful completion programs for the 3,000-ft-thick interval of highly fractured, interbedded sandstones, mudstones, limestones, and dolomites.

To determine the most effective completion techniques, the Utah Geological Survey and Halliburton analyzed 246 stimulation treatments from 67 wells in the Bluebell Field, Uinta Basin, Utah, as part of the Class 1 field demonstration project.[1]

Recommendations follow for how to increase production response from this thinly bedded, heterogeneous reservoir.

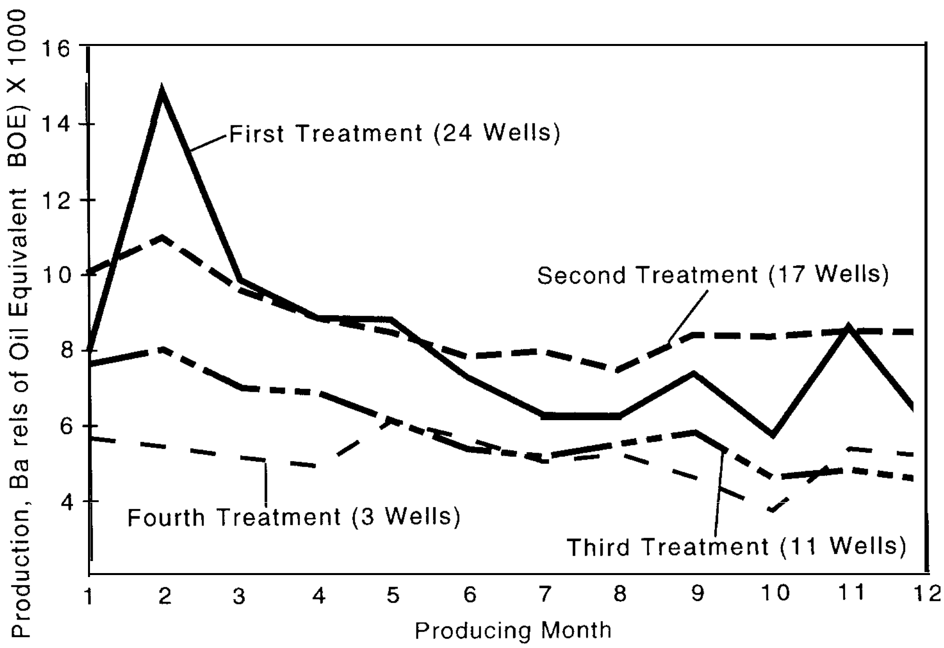

Figure 1 Average Decline Curves by Consecutive Acid Treatments for the Wells Studied in the Bluebell Field, Utah

IDENTIFY PRODUCTIVE ZONES

A most critical task for effective completion design is to improve bed evaluation, identify productive zones, and limit the size of the treatment interval.

When the productive zones are thin, this is easier said than done, but advances in old technologies and some new methods can help.

Production tests using these tools can help identify thin zones:

- Bridge plug and packer
- Pin Point Injection packer (PPI tool)
- Packer and the natural pressure gradient present in the formation

Recently developed imaging technologies, such as advanced logging techniques and borehole imaging (The *Class Act,* Fall 1995), as well as high resolution seismic techniques are being successfully used to image productive zones.

Two vertically segregated natural fracture sets (an east-west set and a northwest-southeast set are present in the field. Better production appears to be associated more closely with the east-west oriented set irrespective of depth, stratigraphy, or lithology.

THE FIRST TREATMENT IS THE BEST

HCl has been, and still is, the recommended treating fluid in the Bluebell Field.

Treatment histories indicate that the initial acid treatment is generally the largest and the most effective (Fig. 1). If additional acid treatments are applied, pumping

[1]This article is based on the Class 1 project ***Increased Oil Production and Reserves from Improved Completion Techniques in the Bluebell Field, Uinta Basin, Utah,*** Annual Report for the Period October 1, 1994, to September 30, 1995 (*in press*), conducted by the Utah Geological Survey, Halliburton Energy Services, University of Utah, Brigham Young University, and Quinex Energy Corp.

volumes larger than the first treatment will probably not be cost-effective.

To prevent formation damage from iron dissolved from tubulars, pickle the tubing before doing the main acid treatment to remove scale and oxides. A rule of thumb for pickling tubulars is 100 gal HCl for every 1,000 ft of tubing. The pickling fluid should be recovered as quickly as possible–allowing it to sit in the formation may cause fines and other solids to drop out in the formation.

Treatment Rates

For an effective treatment, a high enough pump rate must be maintained to carry the diverting agent into the formation. Results from the analysis suggest that pump rates between 8 and 12 bbl/min with proper diverting agents will direct the fluid to the perforated intervals. Maximum treatment pressure should be reached toward the end of the treatment if enough diverter is pumped and pumped properly.

Larger intervals of 800-1000 ft, like many treated in Bluebell Field, require ultra-high pump rates up to 100 bbl/min at treatment pressures of up to 5,000 psi.

Increasing pump rates down a 2-7/8 diameter tubing will only increase the wellhead treatment pressure (WHTP), not the bottom hole treatment pressure (BHTP). A cost-effective way to achieve high pumping rates is to pull the tubing out and pump down the casing. This, of course, must be done in wells with good casings and adequate cement jobs.

Additives

For best results in acid treatments, these additives are recomnended per 1,000 gal 15% HCl:

- 5-10 gal corrosion inhibitor
- 3–10 gal surfactant
- 3-7 gal clay control
- 10 gal iron control
- 10 gal acid gelling agent
- 10 gal solvent
- 10 gal scale inhibitor

Diverters

Diverting the treatment fluid into all of the perforations is especially important when treating large intervals. The RCN ball sealers commonly used in the Bluebell Field provide excellent diversion if the fluid and flow rates are high enough to allow the balls to seat in the perforations.

Perforations must be in fairly good shape for the balls to seal properly. Severe corrosion or pipe deterioration will adversely affect the efficiency of the ball sealer. A minimum of 50 gal of fluid per ball should be pumped at a rate of 5–8 bbl/min for successful sealing.

A Cost-Effective Treatment Design

The most cost-effective acid treatment appears to be between 20,000 and 30,000 gallons of 15% HCl pumped in four stages. Three of the diverter stages should be pumped with enough volume to divert the fluid to all three of the reducing intervals typically perforated.

The diverter fluid should be gelled so that the friction characteristics are similar to that of the acid. The diverter fluid should be compatible with the diverter material, and contain the same surfactant and clay control additives that are used n the acid system. If ball sealers are used a minimum of 50% excess will give proper diversion if the fluid volume and pump rate are appropriate and the perforations are in good shape.

Other Techniques with Potential

Hydraulic fracturing with proppant has not been adequately tested in the Bluebell Field. Only 2% of the 246 treatments analyzed were proppant fracture treatments, and those used small volumes of sand as the propping agent. The ability to do high-rate proppant fracture treatments over large intervals has been proven in other fields, and may have potential for newer wells in the Bluebell Field.

Hydrojetting, a technique using high-pressure liquid to cut 1–2 in. diameter holes in a formation, could be used to overcome near well-bore damage caused by drilling and treatment fluids. Extended hydrojetting can also be used to provide a small horizontal wellbore into several producing intervals within the same well.

INNOVATION SAVES MONEY FOR RUSSELL PETROLEUM

by Merle Grabhorn, University of Tulsa

The Savonburg Field Class I project, near Chanute, Kansas, is typical of many fields in the area. It is a mature waterflood in shallow (620 ft) Pennsylvanian sands with production less than 40 BOPD and lifting costs nearly equal to the price of oil. Obviously, lowering operational costs are a major factor in increasing profitability.

Lowering costs in such an operation requires more than efficiency, it needs a "can do" problem-solving attitude and a willingness to innovate. These two items are not expensive and are certainly not scarce in Chanute. In fact, Russell Petroleum personnel may have more than their fair share.

SOLVING A SCALE PROBLEM

Savonburg Field historically suffered from water-quality problems in the waterflood operations. Maintaining infectivity was a constant process of well inspection and costly workovers combined with constant injection-system cleanups.

One difficult problem has been the formation of barium scale in the flow lines. After cutting into one of the 4-in. lines in the field, workers noticed that the scale was mixed with layers of oil that was carried with the produced water. The idea that the oil was part of the framework holding the scale in place was tested by introducing a nonionic, water-dispersible emulsion breaker and surfactant into a section of the flow lines to remove the oil. The emulsion breaker was introduced into a section of line and allowed to soak for several hours followed by a washout. As expected, large amounts of scale were washed out of the line. The rest of the lines were successfully cleaned using the emulsion breaker.

If the flow lines were badly scaled, there was little question as to the condition of the wellbore in the injection wells. The problem was now how to use the emulsion breaker in the injection wells to effectively clean the barium scale from the tubing and perforations, remove the loosened scale from the well, and do all this inexpensively. To make matters slightly more complicated, the injection wells had 2-7/8-in. casing, considerably smaller than the 4-in. flow lines, making clean-out difficult.

HOME-MADE JET BIT

After some consideration, Russell Petroleum made a l-in. jet bit out of a length of 4140 steel. The hollow bit had 4 small carbide jets about 2-in. apart arranged 90° from each other around the jet bit body. A borehole within the jet body was large enough to accommodate a 5/16-in. steel ball. By lowering the bit down the well bore with a coiled tubing unit and spotting the bit at the perforations, the ball could be dropped into the tubing. Clean injection water from the onsite flotation unit was pumped down the wellbore forcing the ball against the end of the jet bit and sealing the tubing The clean water, under 1,000– 1,500-lb pressure, was diverted out of the 4 carbide jets on the side of the bit directly on the casing walls and perforations. The agitation of the water, mixed with the demulsifing chemicals, blasted the scale and other sludges into small pieces, which were continually reduced in size by the agitation of the jets and exposure to the chemicals. Following the jetting step, the ball was reverse circulated to the surface, and the well washed to the bottom.

FOAMING THE WELL

The problem of removing large amounts of debris resulting from the cleanup was solved by pumping down a cationic foam, compatible with all the chemicals used in the cleanup. The viscous foam trapped the fines and carried them to the surface more efficiently than water,

When the injection well cleanup was completed and the costs tallied, it was clear that there was substantial savings. A normal acid wash cleanup of an injection well in Savonburg Field costs about $2,000. The cost of the cleanup using the demulsifier and jet tool was about $1,000, a significant savings. Also, there was virtually no disposal problem–only a barrel or two of fluid needed to be removed. Furthermore, this method appears to provide a longer lasting cleanup.

CALENDAR

PAPERS/POSTERS

SPE/DOE 10TH SYMPOSIUM ON IMPROVED OIL RECOVERY, TULSA, OK, APRIL 21-24

Implementation of Reservoir Management Plan–Self Unit, Glenn Pool Field (Class 1), M. Kelkar & D. Richmond, U. of Tulsa, 918-631-3036.

Mathematical Modeling of Gravity Drainage after Gas Injection into Fractured Reservoirs (Class 3), D. S. Schecter &B. Guo, Parker & Parsley, 915-571-1685.

Economics of Light Oil Air Injection Projects (Class 1), T. Gillham, Amoco, 713-366-7771.

Utilization of Indigenous Microflora in Permeability Profile Modification of Oil Bearing Formations (Class l), J. Stephens, Hughes Eastern, 601-969-6600.

A New Analytical Method to Evaluate, Predict and Improve CO_2 Flood Performance in Sandstone Reservoirs (Class 1), S. Bou-Mikael, Texaco, 504-593-4565.

Effect of Scale and Connectivity on Primary and Secondary Recovery (Class 1), R.J. Pawar et al., Inland Resources/Lomax Exploration, 801-581-4460.

Development of an Improved Waterfood Optimization Program in the North East Savonburg Waterflood (Class 1), L. Schoeling, U. of Kansas, 913-864-7398.

CO_2 Huff and *Puff Initial Results from a Water Flooded SSC Reservoir* (Class 2), S. Wehner, Texaco, 915-688-2954.

CLASS 2/3 PERMIAN BASIN WORKSHOP, IMPROVING PRODUTION FROM SHALLOW-SHELF CARBONATE (CLASS 2) RESERVOIRS, CLASS 3 PROJECTS POSTER SESSION. CEED, MIDLAND, TX, MAY 15

The TOW 1-3 Well: a Horizontal Drain Well in Crystal Field, Montcalm CO., MI (Class 2),,. Wood, Michigan Tech. U., 906-487-2531.

Update on the South Cowden Field Project (Class 2), M. Gerhard, Phillips Petroleum, 915-368-1412.

Application of Advanced Reservoir Characterization, Simulation, and production Optimization Strategies to Maximize Recovery in Slope and Basin Clastic Reservoirs, West Texas (Delaware Basin) (Class 3), S. Dutton et al., BEG, U. of Texas, 512-471-1534.

An Integrated Study of the Grayburg/ San Andres Reservoir, Foster and South Cowden Fields, Ector Co., TX (Class 2), H. Smith, Laguna Petroleum, 915-682-7356.

Improved Oil Recovery in Mississippian Carbonate Reservoirs of Kansas [Class 2), T. Carr et al., U. of Kansas/Kansas Gee. Sur., 913-864-3965.

Poster Session, *Nash Draw Field, Eddy Co., NM* (Class 3), M. Murphy, Strata Production, 505-622-1127.

AAPG, SAN DIEGO, CA, MAY 19-22

Hydrocarbon Transport and Shearing Processes in Antelope Shale, Monterey Formation, SanJoaquin Valley, CA (Class 3), S. K. Dholakia et al., Chevron, 805-395-6388.

Geological and Reservoir Characterization of Shallow-Shelf Carbonate Fields, Southern Paradox Basin, UT (Class 2), T. C. Chidsey Jr. & D. E. Eby, Utah Gee. Sur., 801-467-7970.

CO_2 *Pilot Design in the Naturally Fractured Spraberry Trend: Project Update and Spraberry Rock Model* (Class 3), T. D. Sheffield et al., Parker & Parsley, 915-571-1685.

Enhanced Carbonate Reservoir Model for Old Reservoir Utilizing New Techniques The Schaben Field (MIssissippian), Ness Co., KS (Class 2), T. Carr et al., Kansas Gee. Sur./U. of Kansas, 913-864-3965.

Acoustic Logging through Casing to Detect Hydrocarbons and Determine Porosity in the Wilmington Field, CA (Class 3), D. Moos et al., Tidelands Oil Prod. /Stanford U.

Tertiary Development of Heavy Oil Sands through Thermal Simulation in the Wilmington Oil Field, CA: A Geological Perspective (Class 3), D. Clarke, City of Long Beach, 310-570-3915.

Flow Unit Modeling in Complex Reservoirs (Class 2 & 3), D. K. Davies et al., D. K. Davies & Assoc., 713-358-2662.

Poster Session, *Low-Permeability, Fractured Reservoirs, S.* Smith, Chevron, 805-395-6388.

Poster Session, *Integrated, Multidisciplinary Reservoir Characterization, Modeling and Engineering Leading to Enhanced Oil Recovery from the Midway-Sunset Field, CA* (Class 3), S. Schamel, U. of Utah, 801-585-5299.

Poster Session, Recovery *of Bypassed Oil Using Horizontal Drains* (Class 2), J. Wood, Michigan Tech. U., 906-487-2531.

SPE/SEG BRECKENRIDGE, **CO,** JUNE 30-JULY 5

Poster Session, *Grayburg/San Andres Reservoir* (Class 2), H. Smith, 915-682-7356.

SEG VAIL, CO, JULY 7-12

Characterization of Old or Abandoned Carbonate Oil Fields in Michigan (Class 2), W. Pennington, Michigan Tech. U., 906-478-2531.

AAPG ROCKY MT. REGIONAL, BILLINGS, MT JULY **28-31**

Carbonate Mound Reservoirs in the Paradox Formation: An Outcrop Analog alone the San Juan River, SE Utah (Class 2), T. C. Chidsey, Jr. et al., Utah Geo. Sur., 801-467-7970.

CALENDAR

WORKSHOPS/ COURSES

APRIL

April 17, Oklahoma Geological Survey/Geo Information Systems Class I FDD Workshop: Layton and Osage-Layton Play, **Oklahoma City, OK (call Michelle Summers, 405-325-3031)**

April 25-26, FINA Class 2, Integrated Reservoir Management and Characterization to Optimize Field Development, **Center for Economic and Energy Diversification, Midland,TX (call University of Tulsa, 918-63 I -2347)**

MAY

May 15, Class **2/3** Permian Basin Workshop, Improving Production from Shallow Shelf Carbonate (Class 2) Reservoirs, **papers on all Class 2 projects; poster session for selected Class 3 projects. Midland, TX (call Steve Melzer at CEED, 9 15-552-2430)**

JUNE

June 6, HGS Continuing Education Short Course, New **Oil from Old Fields: Identifying Opportunities for Reserve-Growth *Potential* in Mature Fields of *the* Frio Fkwial-Deltaic Sandstone Ploy, Vicksburg** *Fault Zone,* **Houston, TX (call Lisa Remington, 512-475-9582)**

June 13-14, FINA Class 2, **Integrated Reservoir Management and Characterization to Optimize Field Development Center for Economic and Energy Diversification, Midland, TX (call University of Tulsa, 918-63 I -2347)**

June 19, Oklahoma Geological Survey/Geo Information Systems Class I FFD Workshop: Prue and Skinner Plays, **Oklahoma City, OK (call Michelle Summers, 405-325-303 I)**

jULY

July 9-10, Petroleum Days, **Utah Geological Survey, Vernal, UT, Increased Oil Production and Reserves from Improved Completion Techniques in the Bluebell Field, Uinta Basin, UT (Class I) (call Roger Bon, 80 I -467-7970)**

HERB TIEDEMANN
DEPARTMENT OF ENERGY
BARTLESVILLE PROJECT OFFICE
P. 0, BOX 1398
BARTLESVILLE, OK 74005-1398

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